Black carbon concentration and bulk carbon composition in central Arizona-Phoenix

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This project investigates the composition and distribution of black carbon (BC) in soil samples from Phoenix, AZ collected during the Central Arizona Phoenix Long-Term Ecological Research Program (CAP LTER) 200-point survey.

Black carbon is the product of incomplete combustion of fossil fuels and biomass and has a range of physical structure from slightly charred biomass to graphic BC. This poster shows preliminary work done to investigate the chemical composition of various BC samples. Chemical composition (structure) is of interest because it allows us to infer information about the reactivity of BC molecules. The presence of certain chemical functional groups can help indicate whether a molecule can undergo a chemical reaction.

Summary of Survey 200 soils AVG (n = 63)

<table>
<thead>
<tr>
<th>Property</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wt % OC (g OC/g soil)</td>
<td>1.1 ± 0.9</td>
</tr>
<tr>
<td>Wt % BC (g BC/g soil)</td>
<td>0.2 ± 0.2</td>
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<tr>
<td>BC/OC (g BC/g OC * 100)</td>
<td>26 ± 2.4</td>
</tr>
<tr>
<td>Avg. Black Carbon δ13C (%)</td>
<td>-17 ± 3</td>
</tr>
</tbody>
</table>

Essential questions for this investigation:

• How much black carbon is stored in Phoenix-area soils?
• How is that carbon distributed across the city?
• What is the structure and reactivity of soil black carbon?

Global BC Cycle

Atmospheric BC

BC by fossil fuel combustion and vegetation fire

Deposition to coastal & open ocean surface

Wind erosion

Sources (Biomass burning and Fossil Fuel)

62 to 284 Tg yr⁻¹

Sinks (Sedimentary BC)

10 Tg yr⁻¹

Imbalance: Inputs do not equal outputs!

52 to 274 Tg yr⁻¹

This imbalance suggests a dynamic role for BC in which it is somewhat reactive in the environment

Awardsments: Steven Earl, Nancy Grimm, Sharon Hall, Natasha Zolatova, Ken Mossman Student Machine Shop, CAP-LTER